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Radiology

Case report

Unilateral femoral deformity due to a focal fibrous tether

P. Rodríguez[1], **M. L. Parra**[3], **M. Miralles**[1], **G. G. de Orbe**[1], **A. Curto**[2]

[1] Department of Pediatric Radiology, Hospital Universitario 12 de Octubre, Ctra de Andalucía Km 5,400, E-28041 Madrid, Spain
[2] Department of Pediatric Traumatology, Hospital Universitario 12 de Octubre, Ctra de Andalucía Km 5,400, E-28041 Madrid, Spain
[3] Hospital Universitario de la Princesa, E-28006 Madrid, Spain

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Abstract. The purpose of this paper is to assess the radiological features of the unilateral angular deformity of the distal end of the femur secondary to a focal fibrous tether. Only five cases of this entity have been reported in the literature. We report another two patients. Magnetic resonance study was performed on one of them, which has not been used in previous cases. Both cases are described with illustrations of the typical radiographic appearances supplemented by CT and MR imaging.

Key words: Femur abnormalities, congenital – Femur deformities – Children – Skeletal system

Introduction

Most angular deformities of the lower extremities in children are related to benign conditions which are corrected with growth. Severe unilateral bowing of the lower extremity is rare and is usually due to pathological condition such as Blount disease, fibrous dysplasia, Ollier disease, neurofibromatosis or a growth disturbance resulting from a physeal injury or infection.

We describe a rare cause of severe unilateral femoral deformity due to a focal fibrous tether that connects the distal femoral metaphysis to the homolateral condylar cartilage, passing through the physis. This entity is a malformative process, and five cases have been reported in the literature [1, 2]. We report another two patients. An MR study was performed in one of them, which has not been used in previous cases.

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Correspondence to: P. Rodríguez

Case reports

Case 1

A 4-month-old boy was referred for evaluation of a varus deformity of the left lower limb. Since birth his parents have noticed less movement in this leg than in the other. Plain film revealed a tunnel-like lesion and angular deformity of the distal end of the femur (Fig. 1).

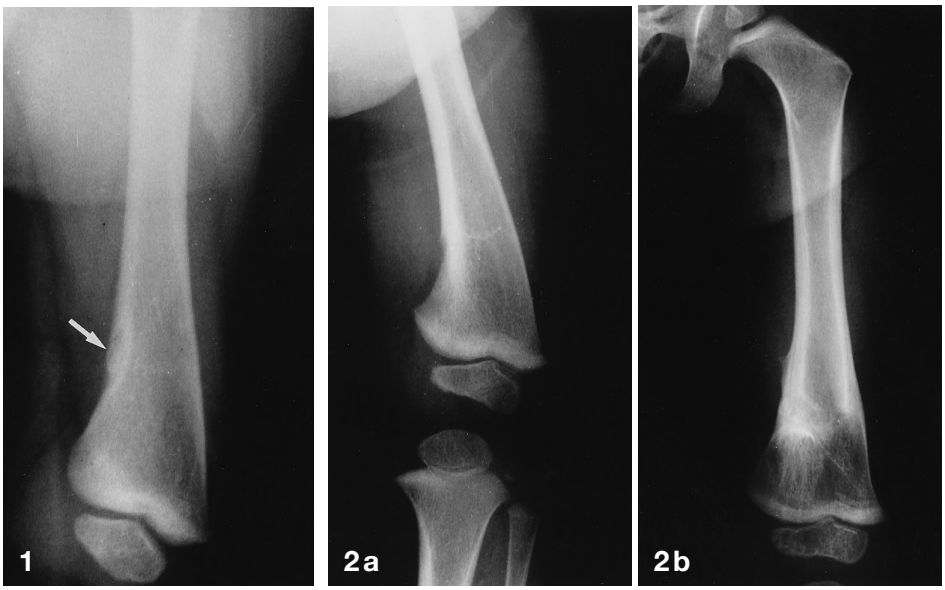
No spontaneous improvement was demonstrated and so, surgery was performed when he was 19 months old. A fibrous tether connected distally to the medial aspect of the distal end of the left femur was found arising from a tunnel in the bone. The fibrous band was excised and a femoral osteotomy was performed. After surgery, there was a good femoral alignment and less than 1 cm of femoral shortening.

Case 2

A 5-month-old girl presented with shortening and bowing of the left leg. Surgery was performed when she was 15 months old because of progressive varus angle.

Plain film revealed a femoral end varus deformity (Fig. 2 a). Computed tomography showed geographical cortical defect (Fig. 3). On MRI, a cord-like low-signal lesion on both T1- and T2-weighted images seems to connect the cortical metaphyseal defect to the homolateral cartilage of the femoral condyle, going through the physis (Fig. 4).

A fibrous tether, measuring 20×10 mm, was removed from the femoral metaphysis, reaching the medial aspect of the distal end of the femur. The varus deformity was corrected with femoral osteotomy, and the bone was fixed with two Kirschner wires. Histological examination of the excised tissue showed it to be fibrous with no cartilaginous or osseous element. Five months after osteotomy, the deformity had been fully corrected.(Fig. 2 b).



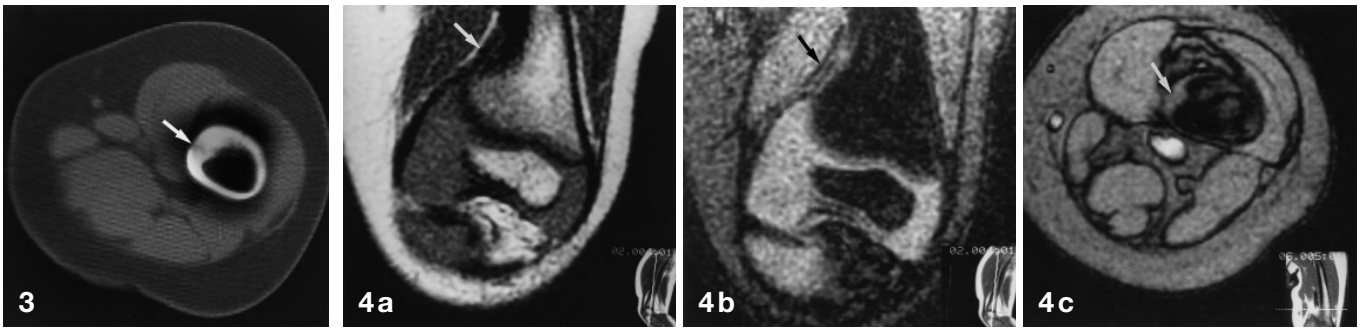


Fig. 1. Anteroposterior plain film: tunnel-like lesion *(arrow)* and angular deformity of the distal end of the left femur

Fig. 2. **a** Anteroposterior plain film: femoral end varus deformity. **b** Anteroposterior plain film 5 months after osteotomy

Fig. 3. Axial scan showing geographical cortical defect in the medial cortex of the distal end of the left femur *(arrow)*

Fig. 4a–c. MR coronal T1- and T2-weighted and axial T2-weighted images: Cord-like low signal lesion on both T1- and T2-weighted images *(arrows)* seems to connect the cortical metaphyseal defect to the ipsilateral condylar cartilage, passing through the physis

Discussion

In 1989 Beaty and Barrett described, for the first time, four cases of incurvation of the distal portion of the femur secondary to a focal fibrous band with unknown origin [1]. Another case was reported by Vallcanera et al. in 1994 [2]. We describe two cases with unilateral femoral deformity, due to a fibrous tether. Magnetic resonance imaging was performed in one of them. As in the previous cases, these cases presented a need for surgery.

Unilateral femoral deformity is an entity analogous to tibia vara caused by focal fibrocartilaginous dysplasia, which Bell et al. reported for the first time in 1985 [3]. It seems that both of them are caused by histologically similar but not identical underlying lesion. The tibial lesion is due to fibrocartilaginous tissue related to the insertion of the pes anserinus [4], whereas in the femur there is a fibrous tether connecting the metaphysis to the ipsilateral femoral physis. There is an important difference between both lesions: the focal fibrocartilaginous dysplasia seems generally to resolve spontaneously with growth [5], in contrast to fibrous femoral lesion that needs surgery.

Summarising the clinical features of the seven reported cases in the medical literature is as follows:

1. The deformity may be noted as early as the age of 2 months, but it is usually when the child begins to crawl or stand that the deformity is noticed and the infant is referred to the physician.
2. There have been five males and two females; of these, four with the right side affected and three with the left.
3. Five patients had unilateral varus femoral bowing and two valgus deformities.

On plain films the radiological findings were cortical irregularities in association with an angular deformity of the distal end of the femur and CT showed geographical cortical defect.

We have used MRI for the first time on this entity. It showed the lesion as a cord-like low-signal lesion on both T1- and T2-weighted images which seemed to connect the cortical metaphyseal defect to the homolateral condylar cartilage, passing through the physis.

In conclusion, we believe that MRI study shows the lesion much better than any other technique. Its use is suggested when the probability of a unilateral femoral deformity due to a focal fibrous tether exists.

The number of patients is too small to set any definitive conclusion. It seems that a surgical treatment is the most reasonable, because the deformity is not correct with more conservative treatment. On the contrary, it increases with growth. This entity must not be confused with other benign congenital conditions that respond to conservative management such as focal fibrocartilaginous dysplasia [5].

References

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Book review

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Funaki B., Lipton M.J.: Radiology On-Call Survival Guide. Boston: Little, Brown and Company 1997. 182 pp., (ISBN 0-316-28237-5), $ 38.00.

In the preface is stressed the increased complexity on residents being on-call. All techniques have to be mastered by the residents even if he/she has the right and duty to seek senior advice when deemed necessary. Interestingly enough, it is stressed that "patient out-come analysis is becoming an important field in radiology, and residents need to understand what each diagnostic modality can offer to yield the quickest and safest results". This is a touch of ethical consideration that is appealing.

The book consists of eleven chapters. The concept is almost complete technique orientation. It could be argued that much of modern medicine is problem and organ oriented and that technique orientation tends to give the radiology resident a more engineer than physician role.

Contrast media reactions and their treatment are shortly and adequately described.

Plain film evaluation deals excellently with interpretation and misinterpretation of the cervical spine after trauma. Some important aspects of intensive care unit radiography are well covered. Almost three quarters of the book is assigned to ultrasonography: basic vascular ultrasonography with principles for Doppler, aspiration biopsies, ectopic pregnancy, gallbladder and ducts, liver transplants, lower extremity veins, pelvis and placenta, kidneys and testicles: everything necessary for a resident on call.

The chapter on computed tomography lacks emergency chest examinations. Such cases are most likely referred for magnetic resonance imaging. At least in European countries, however, CT is still in use in such cases and would have deserved mentioning. Otherwise, the chapter is well written, especially on the head and on abdominal and pelvic trauma. Magnetic resonance imaging deals with aortic dissection and the spinal cord. Brain MRI in emergencies should have been mentioned.

Bowel obstruction, esophagogram, urography, retrograde pyelography and cystography are succinctly described.

Nuclear medicine examinations are not commonly performed as emergencies in radiology departments in Europe. The chapter reflects American trust in nuclear medicine when European radiologists either are not involved in it or prefer ultrasonography, CT and MRI studies.

It may be discussed whether interventional procedures on an emergency basis should only occasionally be the responsibility of a European resident. For the well-being of the patient, senior help may be necessary. The chapter is well written, however.

Neuro-interventional procedures comprise cerebral angiography and myelography. I have the same objection to this chapter as to the previous one. There is, however, nothing wrong with the presentation of the chapter.

The chapter on paediatrics deals with acute abdomen and chest, child abuse, head and hip ultrasonography and a subchapter on the important diagnosis and radiological treatment of intussusception.

Finally, radiation exposure data and radiation protection measures are briefly presented. This subject is not of much direct help but may spur the residents and the nurses to be careful especially with pregnant women and children.

The index is adequate and the references are all North American, which perhaps may be explained by the contents of the emergency libraries in The United States.

For the price it was felt among our residents that parts of the book could be a valuable checklist. The book does not, however, fill a great need in Europe.

J. H. Göthlin, Göteborg